

Remarks

1) Summary of the Office Action

Claims 1 – 47 were pending in the case.

By an Office Action dated January 29, 2003 the Examiner rejected claims 1, 8, 16, and 28 under 35 USC 102 as being anticipated by US Patent 5,909,015 of Yamamoto.

Claims 8 – 12, and 22 were rejected under 35 USC 102 as being anticipated by US Patent 2,261,111 of Engholm.

Claims 7, 14, 15, 19, 20, 21, 24 and 25 were rejected under 35 USC 103 as being obvious given Yamamoto and either US P 5,042,072 of Button or US P 5,357,586 of Nordschow.

Claims 1 – 5, 28 – 44, and 47 were rejected under 35 USC 103 as being obvious given US Patent 2,261,111 of Engholm in light of US Patent 2,261,110 of Engholm.

Rejections under 35 USC 112 for lack of proper antecedent basis were made against claims 6, 8, 13, 17, 27, 45, and 46.

Claims 23 and 26 were allowable.

2) Commentary

Claim 1

Independent claim 1 has now claims the features of a loudspeaker, rather than merely the front plate of a loudspeaker as had formerly been the case. This amendment therefore includes significant grammatical re-construction of the claim, and consequent amendments to all of claims 2 – 7 dependent from claim 1.

The applicant notes that Yamamoto employs an open-backed assembly to permit escape of air to the rear of the unit. Both Engholm references appear to employ a solid pole piece in which there does not appear to be a passageway defined.

It is believe that in light of the amendments, claim 1 and all claims dependent therefrom, namely claims 2 – 7, are presently allowable over the art of record in the case.

Claim 8

Claim 8 has been amended to overcome the rejections under 35 USC 112. Claim 8 has also been amended to indicated that the magnetic flux path assembly is closed-backed, and that there is an air passage in the pole piece. As such, the applicant respectfully submits that claim 8, and all claims dependent therefrom, namely claims 9 – 27, are also allowable.

Claim 28

Claim 28 has been amended to indicated that the magnetic flux path assembly has a closed back. The applicant again notes that neither Engholm reference appears to show or describe an air passageway form in the pole piece.

The applicant submits that claim 28 and all claims dependent therefrom, namely claims 29 – 41, are presently allowable.

The applicant has amended claim 38 to employ more general terminology.

The dependencies of claims 43 to 46 appear to have been incorrect, and have now been amended.

Claim 47

Claim 47 has been amended to indicate that the magnetic flux path assembly is closed-backed, and that motion of the diaphragm to expel air forces air out through the venting in the front plate. As such, the applicant respectfully submits that claim 47 is now allowable over the art of record in the case.

Claim 48

New claim 48 and new dependent claims 49 and 50 have been added. The applicant respectfully submits that claim 48 and dependent claims 49 and 50 are allowable over the art cited in this case.

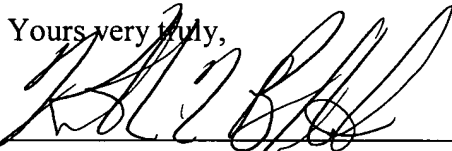
General

A number of grammatical and syntactical corrections have been made throughout the claims. These amendments are largely self-explanatory. A full copy of the claims, as amended, is attached for the convenience of the Examiner.

Conclusion

In view of the amendments and commentary, the applicant respectfully submits that all of claims 1- 50 presently pending in this case are in a condition to permit allowance. Therefore the applicant requests early and favourable disposition of this application.

Yours very truly,



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Full Set of Claims, As Amended Herein, For the Convenience of Examiner Harvey:

I claim:

1. (Currently Amended) A loudspeaker comprising:

- * a closed-backed magnetic flux path assembly;
the magnetic flux path assembly having a pole piece, a magnet, a magnetically permeable front plate, and a magnetic flux path between one pole of the magnet and the pole piece and between the other pole of the magnet and said front plate;
said front plate having an opening defined therein sized to fit about the pole piece and to co-operate with the pole piece to define a gap;
a diaphragm, a voice coil mounted to said diaphragm, said diaphragm being driven by said voice coil, said voice coil being mounted in said gap;
said gap accommodating movement of said voice coil;
said diaphragm having a central dust cap;
an enclosed cavity being defined within said voice coil and between said dust cap and said pole piece;
said magnetically flux path assembly having an enclosed space defined therein about said pole piece;
- * said pole piece having a passageway defined therein, said passageway providing a fluid communication path between said cavity and said enclosed space; and
- * said front plate has venting defined therein external to the voice coil, said venting permitting fluid communication to ambient from said enclosed space through said plate external to the voice coil.

2. (Currently Amended) The loudspeaker of claim 1 wherein said front plate has an outer periphery, an inner periphery defining said opening, and said venting is segregated from said inner periphery.

3. (Currently Amended) The loudspeaker of claim 2 wherein said front plate has the form of a disc in which said inner and outer peripheries are circular and concentric.

4. (Currently Amended) The loudspeaker of claim 3 wherein said venting includes an array of apertures spaced outwardly from, and having a pitch circle concentric with, said inner periphery.

5. (Currently Amended) The loudspeaker of claim 4 wherein said apertures are circular.

6. (Currently Amended) The loudspeaker of claim 1 wherein said opening has a periphery, a portion of said periphery being formed on an arc of a circle, said arc having a radius, and said venting includes at least one rebate let into said periphery, and extending radially outwardly further than said radius.

7. (Currently Amended) The loudspeaker of claim 1 wherein said opening has a crenellated profile.

8. (Currently Amended) A closed-backed magnetic flux path assembly for a loudspeaker having a diaphragm, the diaphragm having a dust cap member, a voice coil for driving the diaphragm and a dust cap cavity defined therewithin, wherein:

said magnetic flux path assembly has a pole piece, an opposed member placed in spaced relationship from the pole piece to define a gap for accommodating reciprocation of the voice coil, and at least one intermediate member mounted to maintain the position of said pole piece and said opposed member relative to each other;

said pole piece, said intermediate member, and said opposed member co-operating to form a continuous path of higher magnetic permeability than said gap;

at least one of said pole piece, said at least one intermediate member, and said opposed member includes a magnet for establishing a magnetic flux in said magnetic flux path assembly and across the gap;

said magnetic flux path assembly has an airflow path defined therein extending between the dust cap cavity and external ambient, for permitting displacement of air between the cavity and external ambient;

said pole piece has a passageway defined therein;

at least a portion of said airflow path is defined in said opposed member external to said gap;

said dust cap cavity being in fluid communication with said passageway defined in said pole piece;

said passageway defined in said pole piece being in fluid communication with said portion of said airflow path defined in said opposed member;

whereby motion of the diaphragm causes displacement of air in said passageway in said pole piece and in said portion of said airflow path defined in said opposed member.

9. (Original) The magnetic flux path assembly of claim 8 wherein said opposed member is a plate having an outer periphery, a closed inner periphery defining an opening extending about said pole piece, said gap lying between said periphery and said pole piece, and said portion of said airflow path is formed in said plate and is segregated from said opening.

10. (Original) The magnetic flux path assembly of claim 9 wherein said plate has the form of a disc in which said inner and outer peripheries are circular and concentric.

11. (Original) The magnetic flux path assembly of claim 10 wherein said portion of said airflow path formed in said plate includes an array of apertures spaced outwardly from, and having a pitch circle concentric with, said inner periphery.

12. (Original) The magnetic flux path assembly of claim 8 wherein said opposed member is a plate having an outer periphery, a closed inner periphery defining an opening extending about said pole piece, said gap lying between said periphery and said pole piece, and at least one portion of said inner periphery defines said gap, and another portion of said periphery defines said portion of said airflow path defined in said opposed member.

13. (Currently Amended) The magnetic flux path assembly of claim 8 wherein:

said magnetic flux path assembly has an axis parallel to the direction of reciprocation of the voice coil, said pole piece has a distal region thereof distant from said intermediate member, said distal region having the form of a body of revolution concentric with said axis;

said opposed member is a plate having a closed inner periphery extending about said pole piece distal region;

said inner periphery has

at least one sector of a circular arc concentric with said distal region, said sector having a radius,

and at least one relief defined in said plate, said relief extending radially outward relative to the radius of said sector;

said gap is defined between said sector and said pole piece; and

said relief defines at least a part of said portion of said airflow path defined in said opposed member.

14. (Original) The magnetic flux path assembly of claim 8 wherein:

said assembly has a central axis;

said pole piece has a round portion;
said opposed member is a disc having an outer periphery and a closed inner periphery extending about said round portion of said pole piece;
said inner periphery has a plurality of sectors of a circular arc having a common radius, and a plurality of reliefs defined in said disc extending radially outward relative to the radius of said sectors;
said round portion of said pole piece and said sectors are concentric about said axis;
said gap being defined between said sectors and said pole piece, and said portion of said airflow path being defined, at least in part, by said reliefs; and
said reliefs and said sectors are arranged in a symmetrical array about said axis.

15. (Currently Amended) The magnetic flux path assembly of claim 8 wherein said pole piece includes said magnet.

16. (Currently Amended) The magnetic flux path assembly of claim 8, for a loudspeaker having a round cylindrical voice coil for driving the diaphragm along an axis of reciprocation, and supporting structure for mounting the diaphragm to the flux path assembly, wherein:

said opposed piece is a first plate mounted to one portion of said intermediate member;
said intermediate member has structure extending away from said first plate, and a second plate mounted to said structure parallel to said first plate;
said first plate has an inner periphery defining an opening, and said pole piece is mounted to extend at least partially from said second plate toward said first plate;
said pole piece and said inner periphery co-operate to define a gap for accommodating reciprocating motion of the voice coil with the pole piece located internally with respect to the voice coil;
said magnetic flux path assembly has an enclosed space defined between said pole piece, said structure, and said pair of plates;
said passageway defined in said pole piece permits fluid communication between the cavity and said space; and
said portion of said airflow path defined in said opposed member includes venting defined in said first plate to permit fluid communication between said space and external ambient.

17. (Currently Amended) The magnetic flux path assembly of claim 15 wherein:

said magnet has a longitudinal axis;
said magnet extends away from said intermediate member and has a distal end distant from said intermediate member;
said distal end of said magnet has a cross-section perpendicular to said axis;
said pole piece has an end cap surmounting said distal end of said magnet, said end cap having a cross-section perpendicular to the axis, said cross-section of said end cap being of greater extent than said cross-section of said distal end of said magnet;
and
said distal end member has passages defined therethrough permitting, in use, fluid communication between the cavity and said space.

18. (Currently Amended) The magnetic flux path assembly of claim 17 wherein said end cap has an external periphery and said passages are channels formed in said periphery.

19. (Original) The magnetic flux path assembly of claim 17 wherein said end cap has a round circular periphery and said passages are apertures formed through said end cap.

20. (Currently Amended) The magnetic flux path assembly of claim 8 wherein said portion of said airflow path defined in said opposed member includes flow director elements for enhancing convective heat transfer from the voice coil.

21. (Currently Amended) The magnetic flux path assembly of claim 8 wherein said portion of said airflow path defined in said opposed member includes at least one deflector for directing airflow toward the voice coil.

22. (Currently Amended) The magnetic flux path assembly of claim 8 wherein said portion of said airflow path defined in said opposed member includes at least one tube having an outlet oriented to urge air displaced through said tube toward a portion of the voice coil.

23. (Currently Amended) The magnetic flux path assembly of claim 22 wherein said tube is a bent tube having a pair of ends, one of said ends being oriented to urge air displaced through said tube toward a portion of the voice coil during flow in one direction, the other being oriented to urge air displaced through said tube toward a portion of the voice coil during flow in the other direction.

24. (Currently Amended) The magnetic flux path assembly of claim 8, the voice coil having an external surface, wherein:

said opposed member is a plate having a closed inner periphery defining an opening extending about said pole piece, said gap being defined between at least one portion of said periphery and said pole piece;

said venting being defined by another portion of said periphery in the nature of a relief defined in said plate, said relief extending radially away from said pole piece and permitting air to traverse said plate; and

said assembly has at least one air guide mounted to said plate to direct air flowing through said relief along at least a portion of the external surface of the voice coil.

25. (Original) The magnetic flux path assembly of claim 24 wherein said assembly includes an array of said reliefs and a corresponding array of air guides spaced about the axis.

26. (Currently Amended) The magnetic flux path assembly of claim 24 wherein said assembly has an internal enclosed space, and said portion of said airflow path defined in said opposed member permits air flow between said internal enclosed space and external ambient, and said assembly has, associated with at least one said relief, an air guide mounted to extend from one side of said plate, and another air guide mounted to extend away from the other side of said plate.

27. (Currently Amended) The magnetic flux path assembly of claim 24 wherein said air guide is a channel having an open longitudinal side facing the voice coil, the voice coil is reciprocally movable parallel to an axis of reciprocation, and said channel extends parallel to the axis of reciprocation of the voice coil.

28. (Currently Amended) A magnetic flux path assembly for a loudspeaker having a diaphragm, the loudspeaker having a round cylindrical voice coil for driving the diaphragm along an axis of reciprocation, the voice coil having a diaphragm dust cap cavity defined therewithin, and supporting structure for mounting the diaphragm to the flux path assembly, wherein:

said magnetic flux path assembly has a closed back;

said magnetic flux path assembly has an annular magnet having a pair of annular faces and an inner wall defining an eye therethrough, a first plate mounted to one annular face of said magnet, a second plate mounted to the other annular face of said magnet, and a pole piece;

said first plate has an inner periphery defining an opening, and said pole piece is mounted to extend at least partially through said eye from said second plate toward said first plate;

said pole piece and said inner periphery co-operate to define a frontal gap in said magnetic flux path assembly for accommodating reciprocating motion of the voice coil, with the pole piece located internally with respect to the voice coil; said magnetic flux path assembly has a space defined between said pole piece, said inner wall of said magnet, and said pair of plates; said pole piece has a first passageway defined therein permitting fluid communication therethrough between the cavity and said space; said first plate has venting defined therein to permit fluid communication between said space and external ambient.

29. (Original) The magnetic flux path assembly of claim 28 wherein said venting includes at least one aperture defined in said first plate, said aperture being segregated from said opening.

30. (Original) The magnetic flux path assembly of claim 28 wherein said periphery includes:
at least one sector of a circular arc, said sector having a radius measured from said axis; and
a relief defined in said first plate, said relief extending away from said axis a distance greater than the radius of said sector,
whereby said venting is at least partially defined by said relief.

31. (Original) The magnetic flux path assembly of claim 28 wherein:
said pole piece is a hollow cylinder having a base end mounted to said second plate, a distal end for location within the voice coil, and a wall extending between said ends;
said base end is closed, said distal end has an opening defined therein; and said wall has at least one port defined therein to permit fluid flow between the cavity and said space through said cylinder.

32. (Original) The magnetic flux path assembly of claim 28 wherein:
said pole piece is a post having a base end mounted to said second plate, a distal end for location within the voice coil, said distal end having an end face for location facing the cavity, and a wall extending between said ends, a portion of said wall bounding said space; and
said pole piece has a passageway defined therein, one end of said passageway terminating at a port defined in said end face of said distal end of said pole

piece, said passageway having another end terminating at a port defined in said portion of said wall bounding said space.

33. (Original) The magnetic flux path assembly of claim 28 wherein said passageway is a straight bore formed in said pole piece on an inclined angle relative to the axis.

34. (Original) The magnetic flux path assembly of claim 32 wherein said passageway has a first bore extending inwardly from said one end of said passageway, and a second bore extending inwardly from said other end of said passageway to intersect said first bore.

35. (Original) The magnetic flux path assembly of claim 32 wherein said second bore is a cross-bore extending fully through said pole-piece and having openings at either end thereof.

36. (Currently Amended) The magnetic flux path assembly of claim 28 wherein
said pole piece is a post having a base end mounted to said second plate, a distal end for location within the voice coil, said distal end having an end face for location facing the cavity, a medial portion narrower than said distal end and a transition wall extending between said distal end and said medial portion, a portion of said wall bounding said space; and
said pole piece has a passageway defined therein, one end of said passageway terminating at a port defined in said end face of said distal end of said pole piece, said passageway having another end terminating at a port defined in said portion of said wall bounding said space.

37. (Currently Amended) The magnetic flux path assembly of claim 36 wherein said transition wall is chosen from the set of transition walls consisting of:

- (a) an annular shoulder extending radially perpendicular to said axis; and
- (b) a truncated conically tapered section; and

said passage is a bore extending parallel to the axis.

38. (Original) The magnetic flux path assembly of claim 28 wherein:

said pole piece is a post having a base end mounted to said second plate, a distal end for location within the voice coil, said distal end having an end face for location facing the cavity, and a wall extending between said ends, a portion of said wall bounding said space; and

said distal end of said pole piece has a sidewall facing said inner periphery of said first plate, said sidewall having at least one relief defined in said sidewall, said relief extending inwardly relative to said sidewall, and said relief has a first end defined in said end face, and a second end giving onto said enclosed space, whereby air can be displaced along said relief between the cavity and the enclosed space.

39. (Original) The magnetic flux path assembly of claim 38 wherein said reliefs in said distal end of said pole piece are grooves formed in said pole piece extending parallel to the axis.

40. (Original) The magnetic flux path assembly of claim 38 wherein said inner periphery of said first plate includes:

at least one sector of a circular arc, said sector having a radius measured from said axis; and

at least one first plate relief defined in said first plate, said first plate relief extending away from said axis a distance greater than the radius of said sector,

whereby said venting is at least partially defined by said first plate relief.

41. (Original) The magnetic flux path assembly of claim 40 wherein said at least one first plate relief is an array of slots formed in a symmetrical pattern in said first plate relative to the axis, said at least one relief in said pole piece is an array of grooves formed in said pole piece, the number of slots is equal to the number of grooves, and said slots are aligned opposite said grooves.

42. (Currently Amended) A loudspeaker comprising:

a diaphragm assembly having a movable membrane, a dust cap mounted to said moveable membrane, a voice coil former, a voice coil formed thereon, and a cavity defined within said dust cap and said former;

a closed-back magnetic flux path assembly having a magnet, a flux land connected in a magnetically permeable path to one pole of the magnet, and a pole piece connected in a magnetically permeable path to the other pole of the magnet;

said diaphragm assembly having framing mounted to said magnetic flux path assembly, and having a suspension to permit said voice coil to reciprocate relative to said framing;

said pole piece extending within at least a part of said voice coil;

said flux land being located in spaced relationship from said pole piece to define a gap therebetween for accommodating reciprocation of the voice coil, the magnet developing a magnetic flux across the gap;
said loudspeaker having an internal space defined between said pole piece, said magnet, and said flux land;
said pole piece having a passageway defined therein having a port opening on said cavity and another port opening on said space; and
said flux land having venting let therethrough to permit fluid communication between said space and an external environment;
whereby displacement of said dust cap urges fluid to be displaced between said cavity and the external environment along a fluid communication pathway that includes said passageway, said space, and said venting.

43. (Currently Amended) The loudspeaker of claim 42 wherein a magnetically permeable suspension fluid is introduced into said gap.

44. (Currently Amended) The loudspeaker of claim 42 wherein said pole piece is a hollow post, said port opening on said cavity being an open end of said post, said port opening on said space being an aperture let through a sidewall of said post, and said post has a base end, opposite to said open end, said base end being closed.

45. (Currently Amended) The loudspeaker of claim 42 wherein said pole piece is a post having a groove let along a face thereof, said port opening on said cavity being one end of said groove, and said port opening on said space being another part of said groove.

46. (Currently Amended) The loudspeaker of claim 45 wherein said pole piece is a post having a longitudinal axis parallel to the direction of reciprocation of said voice coil, and said groove is parallel to said axis.

47. (Currently Amended) A loudspeaker comprising:
a diaphragm assembly having a movable membrane, a voice coil former, a voice coil formed thereon, and a cavity defined within said membrane and said former;
a closed-backed magnetic flux path assembly having a magnet, a flux land connected in a magnetically permeable path to one pole of the magnet, and a pole piece connected in a magnetically permeable path to the other pole of the magnet;

said diaphragm assembly being mounted to said magnetic flux path assembly, and having a suspension to permit said voice coil to reciprocate relative to said magnetic flux path assembly;

said pole piece extending within at least a part of the voice coil;

said flux land being located in spaced relationship from said pole piece to define a gap therebetween for accommodating reciprocation of the voice coil, the magnet developing a magnetic flux field across the gap;

a cavity being defined between said diaphragm, said voice coil and said pole piece;

said loudspeaker having an internal space defined between said pole piece, said magnet, and said flux land;

motion of said diaphragm compelling displacement of air between said cavity and said enclosed space; and

said flux land having venting let therethrough to permit fluid communication between said space and an external environment; and

in use, said diaphragm being movable toward said pole piece to expel air from said cavity toward said enclosed space to compel displacement of air from said enclosed space through said venting.

48. (New) A loudspeaker comprising:

a magnetic flux path assembly and a co-operable diaphragm,

said diaphragm having a voice coil mounted thereto;

said magnetic flux path assembly having a pole piece, and an opposed piece located in opposition to said pole piece, said pole piece and said opposed piece being spaced apart to define a gap therebetween;

said voice coil being mounted for reciprocal movement in said gap;

said pole piece having a relief formed therein for conducting air displaced by motion of said diaphragm, said relief having an open side facing said voice coil; and

said opposed piece having a relief formed therein for conducting air displaced in consequence of motion of said diaphragm relative to said pole piece, said relief of said opposed piece having an open side facing said voice coil.

49. (New) The loud speaker of claim 48 wherein said diaphragm is operable to urge air to be displaced in opposite directions past said voice coil in said respective reliefs of said pole piece and said opposed piece.

50. (New) The loud speaker of claim 48 wherein said diaphragm is operable to cause air to be displaced in said reliefs adjacent to both inside and outside faces of said voice coil.